

ABSTRACT

A catheter for use in delivery or withdrawal of a formulation, wherein the catheter has an outer layer comprising a bio-compatible material and a barrier layer comprising a material that provides a more effective barrier than the outer layer against inward and outward diffusion of substances that may cause destabilization of the formulation. The outer surface of the barrier layer contacts at least a portion of the inner surface of the outer layer. The catheter may include a flared distal end tip to aid in the release, during a bolus delivery or catheter flush, of any obstruction situated at the distal end tip of the catheter. The larger cross-sectional area at the flared distal end tip minimizes the chances that any obstruction that develops at the distal end tip will be sufficient to hinder the flow of the formulation within the lumen of the catheter. The catheter may also include a slit valve at the distal end tip which has one or more and, preferably a plurality of slits that may be elastically extended to an open position by the expulsion of the formulation during an IIP pump stroke. During the interval between IIP pump strokes, the slits return to a closed position and hinder the inflow of body fluid into the distal end tip.